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Walla Walla District

United States Environmental Protection Agency
Region 10

DREDGED MATERIAL MANAGEMENT PLAN AND ENVIRONMENTAL IMPACT STATEMENT

McNary Reservoir and Lower Snake River Reservoirs

APPENDIX I
Section 404(b)(1) Evaluation

FINAL
July 2002

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13. ABSTRACT *(Maximum 200 words)*
This final Dredged Material Management Plan/Environmental Impact Statement (DMMP/EIS) presents the Corps of Engineers' programmatic plan for maintenance of the authorized navigation channel and certain publicly owned facilities in the lower Snake River reservoirs between Lewiston, Idaho and the Columbia River, and McNary reservoir on the Columbia River for 20 years; for management of dredged material from these reservoirs; and for maintenance of flow conveyance capacity at the most upstream extent of the Lower Granite reservoir for the remaining economic life of the dam and reservoir project (to year 2074). The Corps, along with the U.S. Environmental Protection Agency, analyzed four alternatives for this Final DMMP/EIS: Alternative 1 - No Action (No Change) - Maintenance Dredging With In-Water Disposal; Alternative 2 - Maintenance Dredging With In-Water Disposal to Create Fish Habitat and a 3-Foot Levee Raise; Alternative 3 - Maintenance Dredging With Upland Disposal and a 3-Foot Levee Raise; and Alternative 4 - Maintenance Dredging With Beneficial Use of Dredged Material and a 3-Foot Levee Raise (Recommended Plan/Preferred Alternative).

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DREDGED MATERIAL MANAGEMENT PLAN
AND ENVIRONMENTAL IMPACT STATEMENT
McNARY RESERVOIR AND LOWER SNAKE RIVER RESERVOIRS

APPENDIX I

Clean Water Act Section 404(b)(1) Evaluation

U.S. Army Corps of Engineers
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TABLE OF CONTENTS

1.0 PROJECT DESCRIPTION

1.1 Location

The Dredged Material Management Plan and Environmental Impact Statement: McNary Reservoir and Lower Snake River Reservoirs (DMMP) evaluates the potential environmental impacts of dredging and dredged material disposal for the upper portion of the Columbia and Snake Rivers navigation project. This portion of the waterway extends approximately 179 miles (288 km) from McNary Lock and Dam to Lewiston, Idaho. Five locks and dams are included within this area.

1.2 General Description

This 404(b)(1) Evaluation is a programmatic document, addressing potential water quality impacts of proposed in-water discharges of dredged materials, which are part of the 20-year plan proposed in the DMMP for dredging operations on the lower Snake River and McNary Reservoir. Upland areas also may be used for the placement of dredged material. Environmental impacts related to upland disposal are evaluated in the DMMP, but are not included in this 404(b)(1) Evaluation, which only assesses impacts resulting from in-water discharges. A general description of the DMMP is provided below for reference.

Construction of the Snake River and Columbia River dams altered the character of the natural rivers, changing the river from a free flowing stream to impounded waters, resulting in the continual deposition of sediments in the lower velocity areas of the system. Accumulated sediment interferes with navigation, reduces flood protection, and impacts aquatic habitat.

In addition, sediment accumulation in the upstream reach of Lower Granite Reservoir, at the confluence of the Clearwater and Snake Rivers, has reduced the flow conveyance capacity of the river channel. This sedimentation threatens to reduce the flow capacity of the river channel enough that the Standard Project Flood could overtop the levees in Lewiston, Idaho. To date, dredging has been the method of choice for the removal of this sediment and restoration of the flow capacity.

The U.S. Army Corps of Engineers (Corps) is authorized to maintain a navigation system on the lower Snake and Columbia Rivers and to manage the lock and dam/navigation projects (generally referred to as "projects" or "reservoirs" in this document) on the lower Snake River from Lewiston, Idaho, to the McNary Lock and Dam project at Umatilla, Oregon, on the Columbia River (including the confluence of the Columbia and Snake Rivers). The Corps also maintains publicly owned recreational areas (such as marinas and swimming beaches), irrigation intake facilities for wildlife Habitat Management Units (HMUs) and recreation areas, and port access channels within the lower Snake River and McNary reservoirs. Historically, the Corps has dredged accumulated sediments from the navigation channel and other facilities on these reservoirs in order to maintain their operational capacities.

An ecological analysis of proposed sedimentation management alternatives is presented in the DMMP. Twelve sediment management alternatives for the Lewiston/Clarkston area were considered. A ranking matrix was developed to compare the management alternatives. Criteria used in the matrix to evaluate management alternatives are related to aspects of the life cycle of migrating salmonids and resident fishes, their food production, and maintaining the biological integrity of the five reservoir ecosystems. The three management alternatives with the greatest benefit were selected for further consideration along with a "no action" alternative. A detailed analysis of environmental effects of the four alternatives is presented in the DMMP.

The preferred alternative, or "Recommended Plan", for long-term management of dredging in the Lewiston/Clarkston area is "Alternative 4 - Maintenance Dredging With Beneficial Use of Dredged Material and a 3-Foot (0.9-m) Levee Raise." As explained in the DMMP, Alternative 4 most completely and efficiently meets the project purpose and need at the least cost, while presenting potential environmental impacts that are no greater, and often less, than other alternatives considered. In addition to the evaluation of management alternatives in the Lewiston/Clarkston area, the DMMP also considered the impacts of dredging proposed throughout the lower Snake River and McNary Reservoir. The evaluation includes consideration of dredged material disposal and identifies a number of potential disposal methods at both in-water and upland sites.

The DMMP is focused, in part, on providing the greatest beneficial use of dredged material that can be implemented on a programmatic basis at this time, and the most flexibility for identifying, evaluating, and implementing beneficial uses of dredged material. Potential beneficial uses that may be considered include:

- Shallow water fish habitat.
- Woody riparian habitat.
- Shoreline restoration.
- Fill for port facilities.
- Fill for levee improvements.
- Hanford remediation and closure activities.capping material.
- Potting soil.
- Fill on non-Federal lands.
- Fill for roadway projects.

Several of the potential beneficial uses for the dredged material do not include in-water discharge. Proposed beneficial uses that may require in-water discharge include the creation of fish habitat, the creation of woody riparian habitat, shoreline restoration, and fill for port facilities.

Other opportunities to use dredged material beneficially may become available over time, but cannot always be anticipated. Therefore, the DMMP contains a process for notification of parties known to have an interest in the use of the dredged material and includes publishing a public notice prior to the proposed dredging/beneficial use activity. The effects of implementing beneficial use projects will be assessed on a case-by-case basis. For projects which include in-

water discharge of dredged material, the Corps will prepare a site-specific Clean Water Act Section 404(b)(1) evaluation for each year that in-water discharges are proposed.

The Corps has identified the first dredging activity that would be conducted under the DMMP. This dredging is currently proposed for winter 2002-2003. The Corps is proposing in-water disposal to create woody riparian and shallow water habitat in Lower Granite Reservoir as the beneficial use of the dredged material. Appendix N provides a detailed description of the proposed dredging areas, disposal plans, environmental impacts, and a site-specific 404(b)(1) evaluation for the proposed winter 2002-2003 dredging project.

1.3 Authority and Purpose

The portion of the Columbia-Snake Rivers navigation system addressed in the DMMP was authorized by the Rivers and Harbors Act of 1945 (Public Law 79-14, 79th Congress, 1st Session) and approved March 2, 1945, in accordance with House Document 704, 75th Congress, 3rd Session. This portion of the navigation system includes the following projects:

- McNary Lock and Dam (McNary) – Lake Wallula, Columbia and Snake Rivers, Oregon and Washington
- Ice Harbor Lock and Dam (Ice Harbor) – Lake Sacajawea, Snake River, Washington
- Lower Monumental Lock and Dam (Lower Monumental) – Lake Herbert G. West, Snake River, Washington
- Little Goose Lock and Dam (Little Goose) – Lake Bryan, Snake River, Washington
- Lower Granite Lock and Dam (Lower Granite) – Lower Granite Lake, Snake River, Washington and Idaho

Each of these projects is authorized to provide slackwater navigation, including locks and a 14-foot- (4.3 m-) deep channel. Additionally, although not part of the DMMP, each project is authorized to provide hydroelectric power generation, irrigation, recreation, and wildlife habitat. Historically, the Corps has dredged accumulated sediments from the navigation channel and the other facilities to maintain their operational capacities.

The DMMP for the lower Snake River and McNary reservoirs is being developed to establish an acceptable plan for restoring the authorized depth of the navigation channel, removal of sediment from port areas, maintenance of public recreational uses, and upkeep of irrigation facilities for wildlife habitat and recreation sites. The DMMP will direct a course of action for managing the removal and disposal of sediment over the next 20 years that is focused on providing beneficial uses (*e.g.*, increased habitat quantity and quality for species listed under the Endangered Species Act).

The purpose of the DMMP is threefold:

1. To develop and evaluate alternative programs to maintain the authorized navigation channel and certain publicly owned facilities in the lower Snake River and McNary reservoirs for the next 20 years;
2. To develop and evaluate alternative measures to maintain the flow conveyance of the Lower Granite Reservoir for the remaining economic life of the project (through 2074); and
3. To develop and evaluate alternative programs of managing dredged material in a cost-effective, environmentally acceptable, and, wherever possible, beneficial manner.

Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material were developed by the Administrator of the Environmental Protection Agency in conjunction with the Secretary of the Army acting through the Chief of Engineers under section 404(b)(1) of the Clean Water Act (33 U.S.C. 1344). The Guidelines are applicable to the specification of disposal sites for discharges of dredged or fill material into waters of the United States.

The purpose of the 404(b)(1) Evaluation is to evaluate the potential impacts to the chemical, physical, and biological integrity of waters of the United States from discharges of dredged or fill material. The 404(b)(1) Evaluation is consistent with and appropriately implements policies expressed in the Clean Water Act. Fundamental to the 404(b)(1) Evaluation is the precept that dredged or fill material should not be discharged into the aquatic ecosystem, unless it can be demonstrated that such a discharge would not have an unacceptable adverse impact either individually or in combination with known and/or probable impacts of other activities affecting the ecosystems of concern.

1.4 General Description of Dredged or Fill Material

1.4.1 Source of Material

Material will be obtained from dredging in areas such as the navigation channel, port facilities, recreation facilities, navigation lock approaches, and irrigation intakes. Dredging methods are described in Section 2 (Table 2-7) of the DMMP/EIS. Sites to be dredged will be further identified in 404(b)(1) Evaluations prepared for specific dredging and disposal activities. Sources of material for disposal activities proposed for the winter of 2002-2003 are included in Attachment 1 to Appendix N.

1.4.2 General Characteristics of Materials

The disposal process is dependent on the physical characteristics of the material and the potential to optimize the benefit to fisheries. Dredged materials will be composed mostly of sediments containing a mixture of silts, sands, gravels, and cobbles carried by inflowing waters as suspended and bedload material. Sediment samples will be collected from the areas to be dredged and will be evaluated for particle size, contaminant levels, and suitability for in-water disposal. Particle size analyses will be performed to identify which dredging sites or portions of sites contain mostly silt and which ones contain mostly sand or coarser material. Based on previous experience in the navigation channel, 85 percent of the material is expected to be sands

[grains greater than 0.008 inch (0.2 millimeter (mm)) in diameter], gravels and cobbles and 15 percent of the material is expected to be silts and finer grained material.

1.4.3 Quantity of Material

Up to 340,000 cubic yards (cy) [259,948.7 cubic meters (m^3)] would be dredged from the five reservoirs as frequently as every 2 years for the next 20 years. Over the life of the project, an estimated maximum total volume of up to 3,400,000 cy (2,599,487 m^3) would be dredged.

Dredging for the recommended alternative would maintain navigation clearances in each of the five reservoirs and maintain flow conveyance of the Lower Granite Reservoir. For the Lower Granite Reservoir, areas that require dredging for navigation are located on the Clearwater River between the Snake River confluence and the Port of Lewiston [between River Mile (RM) 0.00 and RM 1.56], and on the Snake River from the vicinity of Silcott Island (near RM 131) upstream to the U.S. Highway 12 bridge (near RM 139.5). A range of dredging volumes between 16,000 and 300,000 cy (12,232.9 and 229,367 m^3) is required on a two-year cycle to maintain the designed navigation channels in the Lower Granite Reservoir. An estimated 4,000 cy (3,058 m^3) are to be dredged from behind Little Goose Dam, and 2,000 cy (1,529 m^3) from behind Lower Monumental and Ice Harbor Dams at approximately two-year intervals. The areas to be dredged in each case are located at the upstream end of each reservoir. The maintenance dredging for the McNary Reservoir is estimated to be approximately 32,000 cy (24,466 m^3) approximately every two years.

1.5 Description of Proposed Discharge Sites

1.5.1 Location

Dredged material will be managed to incorporate beneficial uses when feasible. Potential beneficial uses involving in-water discharge may include:

- Shallow water fish habitat.
- Woody riparian habitat.
- Shoreline restoration.
- Fill for port facilities.

Potential in-water discharge sites for the creation of fish habitat are identified on Plates 1-16 and Figure 2-6 in the DMMP.

Dredged materials deemed unsuitable for in-water disposal, but acceptable for upland disposal, will be disposed of at the Joso upland disposal site if a feasible beneficial use is not available.. Dredged materials that do not meet applicable environmental health and safety requirements will be transported to a licensed landfill facility.

One potential site for the creation of woody riparian habitat has been identified between RM 131.6 and 133.4 on the Snake River. This site is described further in the 404(b)(1) evaluation for the proposed winter 2002-2003 work in Attachment 1 to Appendix N of the DMMP. The

location and dimensions of this site are shown on Plates N-13 and N-14 in Appendix N of the DMMP. Other potential in-water discharge sites for the creation of woody riparian habitat may be identified in future 404(b)(1) evaluations.

Site specific 404(b)(1) evaluations will include more detailed information regarding the location of individual discharge sites. The 404(b)(1) evaluation for proposed winter 2002-2003 work is included in Attachment 1 to Appendix N of the DMMP.

1.5.2 Size

The size of potential discharge sites would vary with the type of beneficial use and the configuration of each individual site. Discharge sites used to create shallow water fish habitat or woody riparian habitat would generally have larger footprints than shoreline restoration or port facility sites.

In-water areas for creation of shallow water fish habitat would vary in size, but would require a minimum shallow water habitat surface area of 4 acres. To determine the minimum surface acreage of habitats to be created, pre-impoundment aerial photos of the shorelines of the lower Snake River were studied. The aerial photos were used to estimate the size of historic sandy, shallow water areas conducive to rearing fall chinook. Prior to construction of the dams, a wide size range of these habitats existed, but a minimum surface area for shallow water habitat creation was designated as 4 acres (1.6 hectares). This acreage was actually lower than the average habitat area found pre-impoundment but was calculated as the minimum necessary to attempt to mimic the free-flowing shoreline habitat required by fall chinook salmon.

The approximate sizes of potential discharge sites for shallow water fish habitat are shown in Plates 1-16 and Figure 2-6 of the DMMP. The size of each potential discharge site was determined by considering several factors, including river geometry, water velocities, fish habitat requirements, and the need to avoid burying known cultural resource sites.

The size of woody riparian habitat creation projects would also vary. The potential discharge site identified between RM 131.6 and 133.4 on the Snake River would be approximately 34 acres, including an 18 acre riparian habitat bench and 16 acres of shallow water fish habitat. A minimum acreage has not been established for the creation of woody riparian habitat.

Site specific 404(b)(1) evaluations would include more detailed information regarding the size of individual sites. The 404(b)(1) evaluation for proposed winter 2002-2003 work is included in Attachment 1 to Appendix N of the DMMP.

1.5.3 Type of Site

Potential in-water discharge sites include shallow and mid-depth in-water disposal sites as shown in Plates 1-16 and Figure 2-6 of the DMMP. Dredged material containing sand, gravel, and cobbles would be disposed of in shallow water to create shallow water habitat or at mid-depth to form a base. Silts and fine material would be restricted to disposal at mid-depth sites. The potential sites are generally located in unconfined, open water areas. The sites were identified

because they are on the inside of a river bend, have suitable water velocities and underwater contours to facilitate habitat creation, and they are configured so the dredged material can be deposited without burying known cultural resource sites.

Site specific 404(b)(1) evaluations will include more detailed information regarding the type of individual sites. The 404(b)(1) evaluation for proposed winter 2002-2003 work is included in Attachment 1 to Appendix N of the DMMP.

1.5.4 Types of Habitat

Existing habitat suitable for juvenile salmonid rearing is limited in the DMMP project area. Sites for potential in-water discharge of dredged material for creation of salmonid habitat have been selected where such habitat does not currently exist. The potential sites have been identified because of factors which facilitate habitat creation, such as location on the inside of a river bend, suitable water velocities and suitable underwater contours.

Sites for the creation of woody riparian habitat have been and would be selected where such habitat does not currently exist or can be expanded. Woody riparian habitat creation projects would typically also include the creation of shallow water fish habitat.

Site specific 404(b)(1) evaluations will include more detailed information regarding the types of habitat at individual sites. The 404(b)(1) evaluation for proposed winter 2002-2003 work is included in Attachment 1 to Appendix N of the DMMP.

1.5.5 Timing and Duration of Discharge

Proposed in-water work will be conducted during the time period prescribed by applicable regulatory agencies. These time periods have been selected to avoid migrations of anadromous salmonids, thus minimizing impacts to these fish. The current in-water work windows are December 15 through March 1 for the lower Snake River reservoirs and December 1 to March 31 for the Columbia River. The timing of the work-window is subject to revision by the regulatory agencies.

In-water work may also be proposed for time periods outside of these windows if water temperatures exceed 73°F and if other site-specific conditions are met that would ensure the absence of endangered species. The proposal of summer season dredging and disposal activities is expected to be limited. If summer season disposal activities are proposed, they will be addressed in a site-specific 404(b)(1).

1.6 Description of Disposal Method

Creation of shallow water fish habitat would be accomplished using bottom-dump barges to transport and deposit the dredged material. As dredged materials are loaded onto the barge the grain size distribution would be evaluated to confirm the material is appropriate for the proposed disposal site. Fine grain silts would be used in a mixture with sands and gravels to fill mid-depth areas and form the foundation for the later placement of sand and gravel for shallow water

habitat. In-water disposal sites designated for each of the reservoirs included shallow water and mid-depth disposal areas that had no known cultural resource sites. The objective of this disposal plan is to establish shallow water habitat from 0 to 20 feet (0 to 6.1 m) deep to restore fish habitat. Equipment limitations may restrict the disposal of material to at or below -10 feet (-3 m) in the near-shore shallow areas. While the formation of shallow water habitat of depths from 0 to 10 feet (0 to 3 m) is desirable, disposal of dredged material to form these shallow areas would be restricted to sites identified as suitable to provide an environmental restoration opportunity and where a sponsor is willing to share costs. These materials provide a favorable substrate for juvenile salmonid rearing and resting. Finally, a drag beam or some other similar device would be used to re-contour the surface of the material dumped from the bottom-dump barges in order to provide a relatively smooth surface. Placement and contouring of sand and gravel would occur with each dredging cycle in order to maximize the amount of habitat created. Figures I-1 and I-2 illustrate this process.

Placement of material for woody riparian habitat creation projects may be performed using four methods: bottom dumping from hopper barges, dozing the material from flat topped barges, hydraulic conveyance from a pump scow, and/or placement with a dragline. Contractors would be allowed to use one or a combination of these methods, but would be required to employ measures to meet turbidity limits and other environmental restrictions during construction. Construction of earthen cells or silt curtains may be used to contain turbidity during construction. Also, the reservoir pool level may be raised to allow more material to be placed by barges. Materials used to construct the bench would be primarily sand with gravel and cobbles. The top of the bench (above the maximum pool elevation) would be capped with hydraulically placed silt.

Disposal methods may be revised over the life of the DMMP if information collected during individual dredged material disposal projects indicates feasible methods to improve the process. Site specific 404(b)(1) evaluations would include updated information regarding disposal methods if applicable. The 404(b)(1) evaluation for proposed winter 2002-2003 work is included in Attachment 1 to Appendix N of the DMMP.

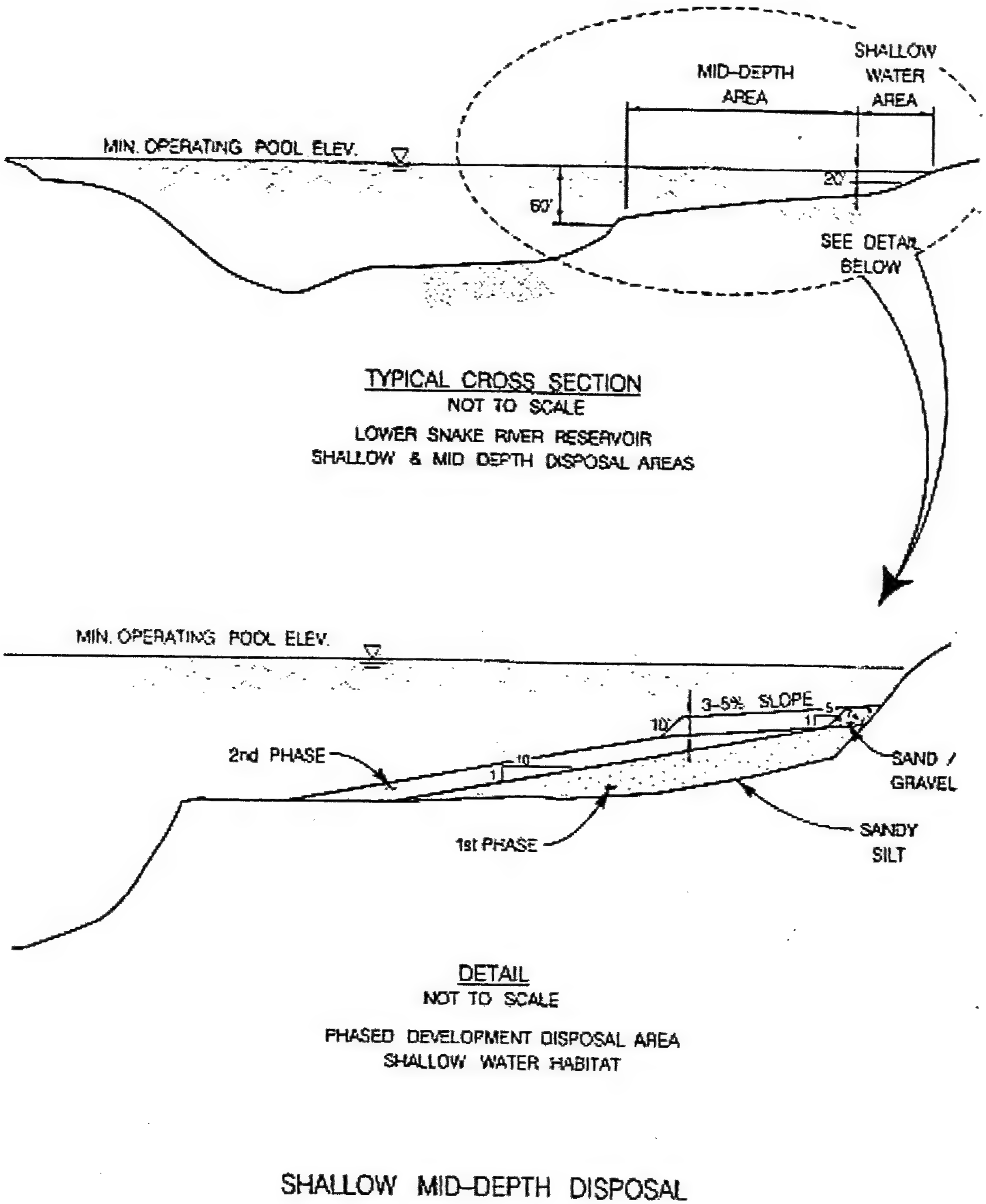

Figure I-1. Cross Section of the Phased Development Disposal Technique for Creating Shallow Water Habitat

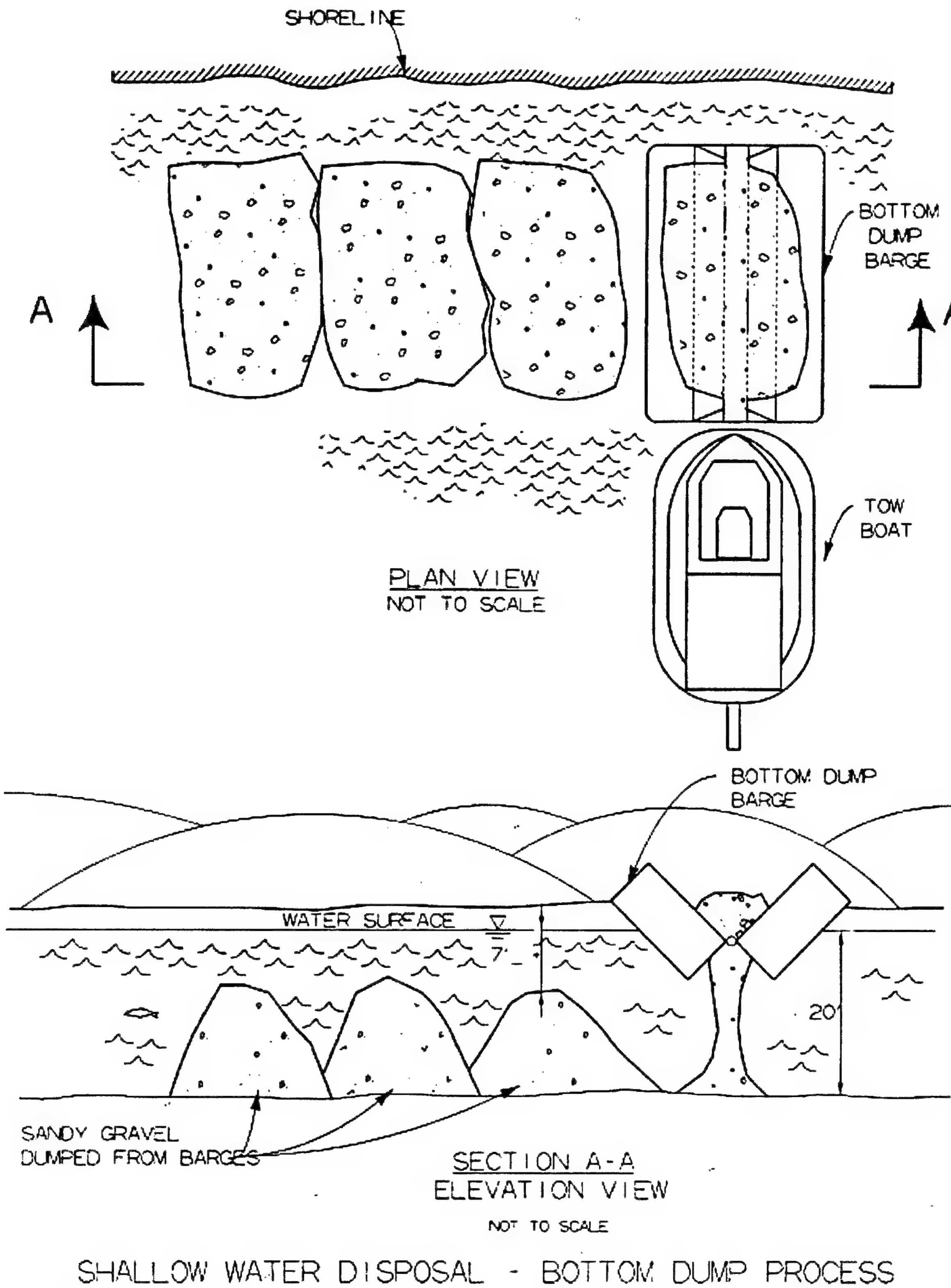

Figure I-2. Shallow Water Sediment Placement Technique Using a Bottom Dump Barge

2.0 FACTUAL DETERMINATIONS

2.1 Physical Substrate Determinations

2.1.1 Substrate Elevation and Slope

The existing substrate elevation and slope varies for each potential in-water disposal site. Dredged material will not be discharged at sites where the minimum operating pool water depth is greater than 60 feet.

Because in-water discharges will be designed for a beneficial use, the substrate elevation and slope after placement will, by design, provide more favorable conditions for specified uses, such as salmonid rearing habitat, shoreline restoration, or bank stabilization.

Site specific 404(b)(1) evaluations will include more detailed information regarding the substrate elevation and slope at individual sites. The 404(b)(1) evaluation for proposed winter 2002-2003 work is included in Attachment 1 to Appendix N of the DMMP.

2.1.2 Sediment Type

The existing substrate sediment type may vary for each potential in-water discharge site. Discharge sites will be selected from sites where the sediment type is not currently suitable for salmonid habitat.

Dredged materials discharged in-water for shallow water habitat creation will be placed so that the substrate is composed of sand, gravel, and cobble materials that will provide suitable salmonid rearing habitat. Selected physical and chemical data will be collected from proposed dredging sites prior to dredging to ensure that the dredged material has a suitable grain size distribution and meets applicable environmental health and safety requirements.

Dredged materials discharged in-water for other beneficial uses will be placed as appropriate, based on site characteristics and the specified beneficial use. Site specific 404(b)(1) evaluations will include more detailed information regarding existing and post-discharge substrate sediment types. A general description of the dredged sediment types that are expected to be available for discharge is included below.

The Corps conducted grain size analyses of sediment samples collected from the proposed dredging areas at the confluence of the Snake and Clearwater Rivers in September 1997, and from port facilities in McNary Reservoir in 1998. Most sediment samples taken for previous dredging operations have contained between 85 and 90 percent sand with 10 to 15 percent silt and fines. These samples are indicative of material that might be dredged from the main navigation channel. Composition of dredged materials from the port areas, close to streambanks, and in boat basins is expected to contain up to 50 percent silt and fines. This would be consistent with the results found in 1996 along the shoreline at the Port of Lewiston. See table 1-1 for grain size distribution throughout the lower Snake River and McNary Reservoir. Grain sizes in table 1-1 are presented in American Society for Testing and Materials (ASTM) E11-70 standard sieve

units. These units correspond inversely to particle size. For example, sieve size of less than five would indicate particle size of greater than 4.0 mm; sieve size of greater than 230 would indicate very fine materials, less than 0.063 mm in diameter. Dredging at the navigation lock approaches is expected to be comprised of predominantly river cobbles and rock.

Table 2-1
Percent of Sample by Grain Size (ASTM Standard Sieve)

Reservoir	<5S	5S	5S-10S	10S-20S	20S-40S	40S-60S	60S-140S	140S-200S	200S-230S	>230S
Ice Harbor	2	0	0	1	18	18	23	0	33	5
Lower Monumental	3	1	1	1	3	7	13	0	70	1
Little Goose	2	1	4	3	10	12	16	0	50	3
Lower Granite	0	0	1	2	7	17	20	1	50	2
McNary	0	0	3.97	0.48	1.2	3.81	15.74	7.69	8.36	58.95

Source: U.S. Army Corps of Engineers, Walla District

Available chemical sediment data from the proposed dredging and disposal locations are summarized in Appendix H of the DMMP. The list of individual compounds to be tested is reviewed at least every 3 to 5 years. Individual compounds are included or dropped from the list based on the existence of evidence of their use in the area.

2.1.3 Dredged/Fill Material Movement

After completion of in-water disposal for the creation of shallow water fish habitat, fill material stability and movement will be monitored as described in Appendix M – Monitoring Plan of the DMMP. Information gathered from monitoring will be used, if applicable, to improve in-water placement strategies for future projects over the life of the DMMP.

For some potential in-water beneficial uses such as woody riparian habitat development, bank stabilization, or port development, cobbles or rock may be used to armor slopes that are susceptible to erosion. Dredge materials proposed to be disposed of at in-water sites will consist of sands and gravels with a limited amount of silts. Limiting the amount of silt will minimize the potential for slope instabilities.

Site-specific 404(b)(1) Evaluations will address material movement abatement and monitoring at proposed discharge sites.

2.1.4 Physical Effects on Benthos

Benthic organisms at in-water disposal sites would be buried by discharge activities. However, the affected benthic population would be small relative to the benthic population of the reservoir system.

At sites where the in-water discharge is designed to create shallow water habitat, macroinvertebrate abundance is expected to be enhanced. With the exception of oligochaete worms, benthic density decreases with depth. Greater than 90 percent of the habitat in Lower Granite Reservoir (and likely the other lower Snake River reservoirs) is considered either mid-depth [20 to 60 feet (6.1 to 18.3 m)] or deep water [greater than 60 feet (18.3 m)]. Because the materials discharged will be composed of sediments dredged from the river bottom, the shallow water and mid-depth habitats created are expected to be conducive to rapid recolonization by benthic organisms.

2.1.5 Other Effects

Other effects on the physical substrate are not anticipated.

2.1.6 Actions Taken to Minimize Impacts

- Alterations to substrate elevation and slope are designed to develop woody riparian and/or fish habitat and are not considered to have adverse impacts.

- Effects on the substrate sediment type are designed to provide woody riparian and/or fish habitat and are not considered to have adverse impacts.

- Embankment material movement will be monitored as described in Appendix M of the DMMP. Information gathered from this monitoring will be used, if applicable, to improve in-water placement strategies for future projects over the life of the DMMP.

- Physical effects on benthos will be minimized by limiting discharges to a localized area, which is small relative to the reservoir system.

- Physical effects on benthos within the project site will be mitigated by the shallow water habitat created by the in water discharge.

2.2 Water Circulation, Fluctuation and Salinity Determinations

2.2.1 Water

2.2.1.1 Conductivity

Between October 1997 and September 1998, the average conductivity in samples collected from the lower Snake River between RM 6 and RM 129 ranged from 68 micro-ohms (µohms) to 363 µohms. Effects of the in-water discharge of dredged material on conductivity are expected to be localized, short-term, and minimal.

During in-water disposal and construction of woody riparian and/or fish habitat, conductivity would be measured in accordance with the monitoring plan. If impacts exceeding regulatory limits are measured, work methods will be modified to reduce the effects.

2.2.1.2 Water Chemistry

The availability of site-specific background water chemistry at potential in-water disposal sites is limited. A summary of available water quality data from the lower Snake River and McNary Reservoir is included in Appendix H of the DMMP.

To minimize the potential for impacts to water chemistry, materials to be dredged will be screened for selected chemicals prior to dredging. Also, turbidity will be regulated and monitored during in-water discharges. Thus, the effects of in-water discharge on water chemistry are expected to be localized, short-term, and minimal.

2.2.1.3 Temperature

Water temperature in the lower Snake River and McNary Reservoir varies with time of year and location. Generally, water temperature is lower in the winter months of January and February, increases slowly during spring runoff (March to May), increases more rapidly in late spring until mid-summer (June to early August), plateaus through mid-September, then decreases steadily through January.

Temperature data collected from the tailraces at Lower Granite, Ice Harbor, and McNary Dams are presented in Appendix H of the DMMP. In 2000, the average monthly temperature measured between December and March ranged from 38.8 °F (3.8 °C) to 47.3 °F (8.5 °C). The average monthly temperature measured between April and November ranged from 48.7 (9.3 °C) to 69.4 °F (20.8 °C).

In-water discharges will be conducted during the in-water work window, when water temperature is relatively low. The creation of shallow water habitat may result in a localized increase in water temperature at the disposal site. However, the area affected will be small relative to the reservoir system. The proposed in-water discharges are not expected to result in long-term impacts to the overall water temperature of the reservoir.

2.2.1.4 Clarity

Between March and October 1997, clarity was measured in the lower Snake River between RM 6 and RM 140. The average Secchi transparency ranged from 1.1 to 2.5 meters and the photic zone ranged from 3.3 to 5.5 meters.

The in-water discharge and shaping of the dredged material at the disposal sites are expected to result in localized turbidity plumes. Operations causing a 5-nephelometric turbidity unit (NTU) increase over background (or 10 percent increase when background is over 50 NTUs) at a point 300 feet (91.4 m) downstream of the project site will not be allowed. Turbidity will be monitored during in-water discharge and construction of woody riparian and fish habitat to ensure that this restriction is not violated.

Total suspended solids concentrations are typically highest during spring runoff and then decline as flows diminish through late summer and into fall. The highest levels observed during spring runoff ranged from 20 to 60 parts per million (ppm) during May and June, but these levels generally decrease to less than 10 ppm for the remainder of the year.

Localized, short-term effects on water clarity are expected within the in-water discharge site and mixing zone. These effects are expected to dissipate quickly after habitat construction is completed. Long-term effects on water clarity are not anticipated.

2.2.1.5 Color

Water color is defined as the true and apparent color by a chroma analysis and is measured only after all turbidity is removed. Color in water may result from the presence of natural metallic ions (iron and manganese are the most common colorants in natural water), humus, plankton, weeds, and wastes. Excessive color affects both domestic and commercial uses and may require removal.

A high resolution (upper end) scanning spectrophotometer or tintometer is required to measure true and apparent color. Actual true and apparent color is poorly understood in the Snake River basin and McNary Reservoir. Currently, no credible data exists. Potential impacts to color are expected to be minimal.

2.2.1.6 Odor

The Corps has not conducted standardized odor tests on the Snake River or McNary Reservoir; therefore data are not available. Changes in odor are not anticipated in association with this project. However, unusual odors detected during construction would be investigated.

2.2.1.7 Taste

Taste test data approved by the ASTM or the U.S. Environmental Protection Agency (EPA) are not available. Any potential changes in taste would likely be associated with suspension of sediments. Because turbidity increases would be localized and short-term, any change in taste would also be localized and of short duration.

2.2.1.8 Dissolved Gas Levels

Background dissolved oxygen data collected from the lower Snake River and McNary Reservoir are summarized in Appendix H of the DMMP. In general, dissolved oxygen levels in the Snake and Columbia Rivers are above 8 ppm with typical seasonal variations. Resuspension of sediments during in-water discharge and habitat construction may cause a localized, short-term decrease in dissolved oxygen levels.

Dissolved gas supersaturation has been one of the major water quality concerns in the Snake River and Columbia basins since the late 1960s. Dissolved gas supersaturation is caused when water passing through a dam's spillway carries trapped air deep into the waters of the plunge

pool, increasing pressure and causing the air to dissolve into the water. Most spillway discharges affecting dissolved gas levels occur during spring runoff between the months of March and June. The proposed in-water discharges will occur during the in-water work window, which is currently December 15 through March 1 in the Snake River and December 1 to March 31 in the Columbia River, and are not expected to increase dissolved gas levels.

2.2.1.9 Nutrients

Nitrogen and phosphorus data collected from the lower Snake River and mid-Columbia River between June and October 1997 are summarized in Appendix H of the DMMP. Total nitrogen concentrations ranged from 0.3 mg/L to 1.1 mg/L. Nitrate was the prevalent form of nitrogen in background water samples. Phosphorus concentrations in the lower Snake River impoundments ranged from 0.025 mg/L to 0.1 mg/L. The reservoirs are generally categorized as upper mesotrophic to eutrophic.

The discharge of dredged material has the potential to increase nitrate and phosphorus levels. However, because the discharges will be conducted during winter months and during months of low productivity, impacts resulting from increased nutrient levels are expected to be localized and of short duration.

The sediments in the Snake River contain high amounts of ammonia (60 to 80 ppm) but it is not fully understood how the nitrogen cycle works in the Snake River reservoirs. The lower Snake River had average water nitrite/nitrate levels from 0.13 to 0.35 ppm. The water ammonia levels were near instrument detection limits in some cases or below the detection limit (0.007 ppm). This suggests the ammonia is probably bound to the sediments. The amount of ammonia that would be released into the water is site specific, dependent upon temperature and pH of the water, and varies with the particle size of the material being dredged. Finer grained sediment (*i.e.*, silt) would be expected to have higher ammonia concentrations and would be more likely to release larger amounts of ammonia into the water.

Ammonia concentrations will be monitored during in-water disposal and habitat construction activities. If the levels reach critical concentrations, in-water disposal or construction methods will be modified to reduce the effects. Because construction will be managed to minimize increases in ammonia concentrations, effects are expected to be localized and short-term.

2.2.1.10 Eutrophication

In-water discharge and habitat construction are expected to have localized, short-term effects on nutrient concentrations. Long-term effects resulting in eutrophication are not anticipated.

2.2.1.11 Others

Other water quality effects are not anticipated.

2.2.2 Current Patterns and Circulation

2.2.2.1 Current Patterns and Flow

Existing data on current patterns and flow at potential in-water disposal sites are not available. The creation of woody riparian habitat and shallow to mid-depth fish habitat would likely have some localized effect on current patterns. The effects are expected to mimic the natural current patterns that exist over naturally occurring mid-depth and shallow water habitat. These changes are expected to be beneficial to salmonids and other aquatic organisms.

In-water discharges designed for beneficial uses with smaller footprints, such as shoreline restoration or bank stabilization, are not be expected to appreciably affect current patterns and flow.

2.2.2.2 Velocity

Existing data on velocity at potential in-water disposal sites is not available. Placement of dredged materials to form mid-depth and shallow water habitat have been analyzed for other projects in the vicinity. In general, the amount of fill is minimal when compared to the overall cross section of the river and does not result in an appreciable change in velocity. In-water discharges designed for beneficial uses with smaller footprints, such as shoreline restoration or bank stabilization, are not be expected to appreciably affect velocity.

The creation of woody riparian habitat and shallow to mid-depth fish habitat may affect velocity at localized points within the in-water disposal sites. However, these changes are expected to mimic natural shallow to mid-depth conditions and be beneficial to salmonids and other aquatic organisms.

2.2.2.3 Stratification

Stratification has not been observed at potential in-water disposal sites and is not expected to occur as a result of in-water disposal for the creation of woody riparian and/or fish habitat.

2.2.2.4 Hydrologic Regime

In-water disposal for the creation of woody riparian and/or fish habitat is not expected to affect the hydrologic regime. Changes in hydrologic regime are most likely to occur in response to changing weather patterns or changes in the overall management of flows within the lower Snake River and mid-Columbia River system.

2.2.3 Normal Water Level Fluctuations

Normal water level fluctuations in the reservoirs are controlled at the dams. In-water disposal for the creation of woody riparian and/or fish habitat are not expected to have a significant effect on water level fluctuations. Proposed discharges will be designed to prevent the creation of standing water bodies in areas of normally fluctuating water levels.

2.2.4 Salinity Gradients

The proposed discharge sites are located in a freshwater system. Because brackish and saline waters are not present, salinity gradients are not an issue for this evaluation.

2.2.5 Actions Taken to Minimize Impacts

- Sediments to be dredged will be evaluated for grain size distribution and selected chemical parameters prior to dredging. Results will be used to determine if the sediments are suitable for in-water disposal.

- Sediments which are not suitable for in-water disposal will be disposed of at an upland beneficial use site, the Joso upland site, or a licensed landfill.

- During in-water discharges for construction of woody riparian and/or fish habitat, selected water quality parameters, including turbidity and ammonia, will be monitored to ensure that applicable regulatory limits are not exceeded at the mixing zone boundary. If regulatory limits are exceeded, the in-water work will be stopped and disposal/construction methods will be modified to reduce the impact.

- Changes to current patterns and circulation are designed to develop woody riparian and/or fish habitat and are not considered to have adverse impacts.

- Normal water level fluctuations are controlled at the existing dams and will be maintained by designing in-water discharges to prevent the creation of standing water bodies.

2.3 Suspended Particulate/Turbidity Determinations

2.3.1 Expected Changes in Suspended Particulates and Turbidity Levels in the Vicinity of the Disposal Site

Background turbidity data collected from the lower Snake River and mid-Columbia River in 1999 indicated that turbidity was lowest at the confluence of the Snake and Clearwater Rivers and increased farther downstream in the Snake River. Turbidity in the Clearwater River had a median value of 2 NTUs. Median turbidity values ranged from 2 to 4 NTUs in the Snake River. Median turbidity values ranged from 2 to 3 NTUs in the Columbia River between the confluence of the Snake and Columbia Rivers and McNary Dam, well below Washington's 25-NTU background action limit. These measurements did not include sampling during periods of heavy runoff or heavy storm non-point source water discharge.

Idaho and Washington specify that turbidity shall neither exceed 5 NTUs over background levels when the background level is 50 NTUs or less nor have more than a 10 percent increase when background is more than 50 NTUs. In Idaho, this applies to small public water intakes and the increase is not to exceed 25 NTUs. For protection of aquatic life, Idaho DEQ specifies that

instantaneous turbidity increases shall not be greater than 50 NTUs above background or greater than 25 NTUs above background for more than 10 consecutive days. Oregon DEQ simply specifies the 10 percent increase criterion.

In-water disposal is expected to result in a localized, short-term increase in turbidity. Turbidity will be monitored during disposal and construction activities to ensure that regulatory limits are not exceeded at the mixing zone boundary [300 feet (91.4 m) downstream of the project site].

2.3.2 Effects on Chemical and Physical Properties of the Water Column

2.3.2.1 Light Penetration

Light penetration within the project site and mixing zone boundary would be reduced during disposal and construction activities. The effects are expected to be localized and short-term.

2.3.2.2 Dissolved Oxygen

Dissolved oxygen may be reduced during disposal and construction activities. The effects are expected to be limited to the project site and mixing zone. Dissolved oxygen levels are not expected to be decrease below 5 mg/L, which is generally accepted to be the minimum concentration required for higher forms of aquatic life. The effects are also expected to be short-term. The work will be conducted during the in-water work window, when water temperatures are relatively cool and are more conducive to dissolution of atmospheric oxygen.

2.3.2.3 Toxic Metals and Organics

Materials to be dredged will be sampled and analyzed for toxic metals or organics that have known potential sources in the watershed. Materials with significant concentrations of toxic metals or organics would either not be dredged or would be disposed of at a licensed landfill.

2.3.2.4 Pathogens

If anthropogenic sources of pathogenic organisms are known to exist in an area to be dredged, the materials will be sampled and analyzed for pathogen indicators prior to dredging. Materials with significant concentrations of pathogen indicators will not be used for in-water disposal.

2.3.2.5 Aesthetics

The turbidity plume would have a localized, short-term aesthetic impact. The impact would occur during the winter, when human use of the reservoir is minimal. The creation of woody riparian habitat, shoreline restoration, or bank stabilization will provide long-term aesthetic improvements.

2.3.2.6 Others

Other effects are not anticipated.

2.3.3 Effects on Biota

2.3.3.1 Primary Production, Photosynthesis

Increased turbidity is expected to have a negative effect on primary production within the project site and mixing zone [300 feet (91.4 m) downstream]. The effect would be localized and limited to the duration of the in-water disposal and habitat construction. The impact would not affect a significant percentage of the reservoir system's primary production.

2.3.3.2 Suspension/Filter Feeders

Increased turbidity is expected to have a negative effect on suspension feeders within the project site and mixing zone [300 feet (91.4 m) downstream]. The effect would be localized and limited to the duration of the in-water disposal and habitat construction. The impact would not affect a significant percentage of the reservoir system's suspension feeders.

2.3.3.3 Sight Feeders

Increased turbidity is expected to have a negative effect on resident sight feeders within the project site and mixing zone [300 feet (91.4 m) downstream]. The effect would be localized and limited to the duration of the in-water disposal and habitat construction. The impact would occur during the in-water work window, which would minimize the number of salmonids present. The impact would not affect a significant percentage of the reservoir system's sight feeders.

2.3.4 Actions Taken to Minimize Impacts

- Expected changes in suspended particulate and turbidity levels will be minimized by managing and monitoring discharges to ensure that applicable regulatory limits are not exceeded at the mixing zone boundary [300 feet (91.4 m) downstream]. If regulatory limits are exceeded, the in-water work will be stopped and disposal/construction methods will be modified to reduce the impact.

- Effects on the chemical and physical properties of the water column will be minimized by chemical and physical screening of potential discharge materials. Sediments to be dredged will be evaluated for grain size distribution and selected chemical parameters in accordance with the Dredged Material Evaluation Framework (Appendix J of the DMMP). Results will be used to determine if the sediments are suitable for in-water disposal. Sediments which are not suitable for in-water disposal will be disposed of at an upland beneficial use site, the Joso upland site, or a licensed landfill.

- Effects on biota will be minimized by restricting discharges to the in-water work window, which is December 15 through March 1 in the Snake and Clearwater Rivers and December 1 through March 31 in the Columbia River.

- Effects on biota will also be minimized by limiting discharges to a small area relative to the reservoir system.

- Materials discharged will be used to construct woody riparian habitat and shallow to mid-depth fish habitat. The long-term benefits of the improved habitat will mitigate for the localized, short-term impacts to biota described above.

2.4 Contaminant Determinations

The purpose of contaminant determinations is to determine the degree to which the proposed discharges would introduce, relocate, or increase contaminants. Under the general framework of Section 404 of the Clean Water Act, testing of dredged material is conducted to assist in making factual determinations regarding the effect of the discharge on the aquatic ecosystem and in determining whether the discharge would comply with the 404(b)(1) Guidelines (40 CFR 230.10 and 230.11). The 404(b)(1) Guidelines provide for testing under certain circumstances. Suggested protocols for testing, when determined appropriate under 40 CFR 230.60 and 230.61, are outlined in the Inland Testing Manual, February 1998, developed jointly by the Corps and the Environmental Protection Agency. The Inland Testing Manual facilitates testing in conjunction with proposed dredged material discharges resulting from navigation dredging.

An outline of the Dredged Material Evaluation Framework is included in Appendix J of the DMMP. This document is currently being developed and will provide detailed information on the dredged material testing protocol to be used for this DMMP. Until this document is completed, the Dredged Material Evaluation Framework for the Lower Columbia River Management Area will be used to develop testing protocol.

Chemicals of concern will vary with individual dredging sites and will be determined through consultation with appropriate water quality regulatory agencies.

2.5 Aquatic Ecosystem and Organism Determinations

2.5.1 Effects on Plankton

Most phytoplankton and zooplankton populations would be in the resting stage during the winter months of the in-water work window. The localized, short-term impacts of the in-water discharge and habitat construction are not expected to have a significant effect on plankton populations.

2.5.2 Effects on Benthos

Benthic organisms would be buried or displaced by the in-water discharge. However, the shallow and mid-depth habitats created are expected to provide a suitable substrate for relatively rapid recolonization by organisms from adjacent benthic communities.

2.5.3 Effects on Nekton

The in-water work window is timed to avoid migrations of anadromous fish and minimize the number of salmonids present in the project area during in-water work. Swimming organisms which are present during the in-water discharge would likely be displaced, but may also be incidentally destroyed by construction activities. The localized, short-term impacts of the in-water discharge are not expected to affect a significant portion of the reservoir system's nekton population. The shallow and mid-depth habitats created are expected to provide long-term benefits for salmonids and other nekton.

2.5.4 Effects on Aquatic Food Web

Because most of the spring and summer dominant species of plankton are in the resting stage during the winter in-water work window, impacts to the spring and summer food web are not expected.

The winter months have a very different food web when compared to the spring, summer, and fall months. Because most freshwater aquatic organisms are poikilothermic, the bioenergetics of the system slow down in parallel to the decrease in temperature. Some organisms feed very little in the winter and live off stored fat reserves. Aquatic insects do feed in winter and rely on detritus for food sources. The winter phytoplankton species are relatively unstudied. Because the impacts of the in-water discharges are limited to the project site and mixing zone, significant impacts to the winter food web outside of the project site are not expected.

2.5.5 Effects on Special Aquatic Sites

Sanctuaries and refuges, wetlands, mud flats, vegetated shallows, coral reefs, and riffle and pool complexes are not known to exist at sites currently identified as potential in-water discharge sites. Proposed discharge sites will be evaluated for the presence of special aquatic sites. If present, such sites will be addressed in the site-specific 404(b)(1) Evaluation.

2.5.6 Threatened and Endangered Species

The Endangered Species Act (ESA) establishes a national program for the conservation of threatened and endangered species of fish, wildlife, and plants and the preservation of the ecosystems on which they rely. Section 7 of the ESA requires Federal agencies to consult with the USFWS and/or NMFS as necessary to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or adversely modify or destroy critical habitat. It also requires that Federal agencies prepare Biological Assessments (BAs) of the potential effects of major construction actions on listed species.

Several species listed as threatened or endangered under the ESA may be found in the lower Snake River reservoirs and McNary Reservoir. Listings of endangered species were obtained from the NMFS and U.S. Fish and Wildlife Service (USFWS). Habitat requirements, timing of occurrence, and the potential location of listed species relative to the dredging and disposal sites were determined. A potential impact determination was made based on the likelihood of ESA-

listed individuals being present or if required habitat was in the project vicinity. If no individuals were likely to be present or no habitat existed, a "no effect" determination was made. If habitat was available, but because of timing of the project the species would not be present, a determination of "may affect but not likely to adversely affect" was made. If habitat was available and individuals could be present, a determination of "may affect and likely to adversely affect" was made. BAs were prepared and sent to both the NMFS and USFWS. Copies of the BAs can be found in appendixes F and G.

In the case of salmonids, certain in-water disposal options have the potential for improving habitat conditions. In these cases, the mitigation was assumed, and a beneficial impact was determined to occur.

ESA-listed threatened and endangered species that may be found in the project area can be divided into anadromous fish, non-anadromous fish, and terrestrial species. All species present in the project dredging and filling areas must be noted and addressed.

Anadromous salmon and steelhead stock from all of the Evolutionary Significant Units (ESUs) listed as Threatened or Endangered under the ESA pass through the McNary Reservoir and lower Snake River. These species include Snake River spring/summer chinook salmon (*Oncorhynchus tshawytscha*), listed as Threatened in 1991; Snake River fall chinook salmon (*O. tshawytscha*), listed as Threatened in 1991; Snake River sockeye salmon (*O. nerka*), listed as Endangered in 1992; Snake River Basin steelhead (*O. mykiss*), listed as Threatened in 1998; Upper Columbia River spring run chinook salmon (*O. tshawytscha*), listed as Endangered in 1999; Middle Columbia River steelhead (*O. mykiss*), listed as Threatened in 1999; and Upper Columbia River steelhead, listed as Endangered in 1997. In addition, the resident Columbia Basin bull trout (*Salvelinus confluentus*) is listed as Threatened under the ESA.

Because threatened or endangered anadromous species are present, the Corps has entered into formal consultation with the National Marine Fisheries Service (NMFS). Actions that have the most potential to impact listed anadromous fish species include dredging of backwater areas and dredging in the tailrace areas of the dams. During the winter, dredging in backwater areas has the potential to disturb juvenile salmonids using these areas for overwintering habitat. Dredging in the tailwater areas of the dams has the potential to disturb and destroy redds of fall chinook salmon, which sporadically spawn in the tailraces of the dams in small numbers. In an effort to avoid disturbances, underwater pre-dredging surveys will be conducted to determine if areas slated for dredging have been used for spawning by fall chinook.

For all non-anadromous fish, and terrestrial species, the Corps has obtained a letter from the U.S. Fish and Wildlife Service (USFWS) noting that they approve of the programmatic approach but will need further analysis prior to detailing their recommendations for any listed species relative to a specific project being proposed. Suitable measures were developed for each listed species through informal ESA consultation with USFWS.

The final findings of NMFS and USFWS will be included in the Record of Decision (ROD).

2.5.7 Other Wildlife

The project reservoirs provide essential habitat for numerous birds, reptiles, amphibians, small mammals, bats, and big game animals. They generally are dependent on tree-shrub riparian habitat associated with the project reservoirs. In general, riparian and wetland areas support higher population densities and species numbers than dryland shrub-steppe, talus, cliff, and/or grassland habitats, which are also prevalent along the project reservoirs. Habitats associated with the river generally support trees or dense grass-forb cover that provide more structurally complex areas and more abundant forage resources than adjacent uplands.

Inundation of the lower Snake and mid-Columbia Rivers following dam construction between the early 1950s and 1975 eliminated most of the woody riparian habitat that was in the area at that time. Since inundation, the shorelines with adequate hydrology have re-established a portion of this riparian community. Due to the lack of suitable hydrology and land management practices of the time, the riparian habitat is now highly discontinuous and dominated by exotic species of vegetation, such as Russian Olive. Additional riparian habitats have been developed through the establishment of intensive HMUs. Thus, wildlife generally associated with riparian habitats tends to be concentrated in these HMUs and in the natural vegetation along the major tributaries, such as the Tucannon, Palouse, and Walla Walla Rivers.

The project reservoirs provide food, water, and cover for numerous wildlife species and are especially important in the Clearwater River, lower Snake River, and McNary Reservoir where moisture is extremely limited. Wildlife that typically uses riparian and wetland habitat associated with the area covered by the DMMP includes waterfowl, upland game birds, raptors, small mammals, other non-game birds, big game animals, furbearers, amphibians and reptiles, and listed threatened and endangered species.

Adverse effects on other wildlife are not expected to result from the proposed in-water discharges. The addition of riparian and shallow water habitat is expected to benefit other wildlife by providing cover and food.

2.5.8 Actions to Minimize Impacts

- Effects on plankton will be minimized by restricting discharges to the in-water work window, when the majority of plankton populations are in a resting stage.

- Effects on plankton will also be minimized by limiting discharges to a small area relative to the reservoir system. In-water work will be conducted and monitored to ensure that direct impacts caused by an increase in turbidity are limited to the project site and mixing zone.

- Effects on benthos will be minimized by limiting discharges to a small area relative to the reservoir system.

- Effects on nekton will be minimized by restricting discharges to the in-water work window, which is timed to avoid migrations of anadromous salmonids and minimize the number of salmonids present is the project area during in-water work.

- Effects on nekton will also be minimized by limiting discharges to a small area relative to the reservoir system. In-water work will be conducted and monitored to ensure that direct impacts caused by an increase in turbidity are limited to the project site and mixing zone.

- Impacts to the aquatic food web will be minimized by restricting discharges to the winter in-water work window, because this minimizes impacts to spring and summer plankton populations that are an important segment of the aquatic food web.

- Impacts to the aquatic food web will also be minimized by limiting discharges to a small area relative to the reservoir system

- Impacts to special aquatic sites are not anticipated. Discharge sites will not be proposed at special aquatic sites.

- Impacts to threatened and endangered species will be minimized by restricting discharges to the in-water work window, which is timed to avoid migrations of anadromous salmonids and minimize the number of salmonids present is the project area during in-water work.

- Adverse impacts to other wildlife are not anticipated. Other wildlife is expected to benefit from development of woody riparian and shallow water fish habitat.

- Potential short-term, localized impacts to plankton, benthos, nekton, the aquatic food web, and threatened and endangered species will be mitigated by the long-term benefits created by development of woody riparian and shallow water habitat.

2.6 Proposed Disposal Site Determinations

2.6.1 Mixing Zone Determination

Historically, a mixing zone extending 300 feet (91.4 m) downstream of the project site has been used for in-water disposal projects in the DMMP area. In general, this mixing zone will be proposed for in-water disposal projects performed as part of the DMMP. If conditions at a particular disposal site warrant determination of a different mixing zone, it will be addressed in the site-specific 404(b)(1) Evaluation.

2.6.2 Determination of Compliance with Applicable Water Quality Standards

Section 401 of the Clean Water Act requires that applicants requesting a Federal license or permit to conduct activities that may result in a discharge in waters of the United States provide to the licensing or remitting agency a certification, from the state in which the discharge will occur, that any such discharge complies with applicable provisions of the Clean Water Act and state water quality standards. For each dredging cycle, the Corps will submit site-specific 404(b)(1) Evaluations to the regulatory agency in the State(s) where a proposed disposal site is located. Along with these submittals the Corps will submit a request for Section 401 water quality certification to the appropriate agency each time in-water disposal is proposed.

2.6.3 Potential Effects of Human Use Characteristic

2.6.3.1 Municipal and Private Water Supply

Municipal and public water supplies are not expected to be affected by potential discharge sites. Site-specific 404(b)(1) Evaluations will address the presence of municipal and public water supplies in the vicinity of proposed discharge sites.

2.6.3.2 Recreational and Commercial Fisheries

Commercial fishing is not conducted in the area covered by the DMMP. Recreational fishing for Snake River steelhead and resident fish occurs in the area covered by the DMMP. In-water disposal and habitat construction activities may have a localized, short-term impact on recreational fishing. Short-term impacts will be minimized by restricting work to the in-water work window, which is not during a period of high recreational use. The creation of shallow water fish habitat is expected to have a long-term beneficial effect on recreational fisheries.

Tribal fisheries are also present within the area covered by the DMMP. Numerous aquatic species, including salmonids, Pacific lamprey, sturgeon, whitefish, and sculpin, retain cultural significance to tribes. Federally recognized tribes have the right to set their own priorities and develop and manage tribal resources within the Federal government framework. Tribal interests and rights are viewed by tribes and traditional communities with the spatial context of tribal ceded lands, traditional native homelands, and places traditionally used by native peoples. Of particular concern to tribes are the potential impacts of water resource management on anadromous fish runs and associated aquatic habitats, and tribal rights to fish for ceremonial, subsistence, and commercial needs. Short-term impacts to tribal fisheries will be minimized by restricting work to the in-water work window, which is designated to reduce impacts to anadromous salmonids. The creation of shallow water rearing habitat is expected to have a long-term beneficial effect on tribal fisheries.

Effects of specific proposed in-water discharges on tribal and recreational fisheries will be addressed in the site-specific 404(b)(1) Evaluations.

2.6.3.3 Water Related Recreation

The lower Snake and Columbia Rivers provide an important recreational resource for the region. There are numerous recreational facilities lining the shores of the lower Snake River reservoirs and McNary Reservoir on the Columbia River. Recreational activities take place throughout the year, with the highest activity levels during the fair-weather periods of late spring, summer, and early autumn. Due to the setting of recreational facilities, most recreation is related to the water resources presented by the Snake and Columbia Rivers. Boating, swimming, and fishing are common activities, as are camping and day-use activities such as picnicking, hiking, and wildlife observation.

In-water disposal and habitat construction is expected to have a localized, short-term effect on recreational activities and facilities. Although water related recreation occurs throughout the year, recreational use is lower during the in-water work window than the rest of the year. The creation of woody riparian and/or fish habitat is expected to have indirect, long-term, beneficial effects on recreation by providing enhanced hunting, fishing, and/or wildlife viewing opportunities.

Effects on water related recreation at specific discharge sites will be addressed in site-specific 404(b)(1) Evaluations.

2.6.3.4 Aesthetics

The lower Snake River system and the Columbia River upstream of McNary are located in an arid region with surrounding open and agricultural landscapes interspersed with urban, suburban, and industrial land uses. The area covered by the DMMP is predominantly rural in character. As the Snake River approaches the Tri-Cities area, the land surrounding the river is comprised of low hills with steppe vegetation. Upstream, the valley walls become steeper, forming a canyon with sidewalls ranging from 200 to 2,000 feet (61.0 to 609.6 m) high. The steep buttes and walls surrounding the river are the dominant features of this landscape (figure 3-2). Throughout much of the area covered by the DMMP, roadways (*e.g.*, U.S. Highway 12) and railroad facilities are adjacent to the reservoirs. Levees have been constructed in several areas, notably in Lewiston-Clarkston and the Tri-Cities areas.

The river provides a water feature in an arid landscape with often dramatic, steep surrounding hillsides and canyons, making it an important aesthetic resource in the area. Many of the recreational facilities that have been developed along the lower Snake River take advantage of the scenic qualities of this landscape. In the urbanized areas of the Tri-Cities and Lewiston-Clarkston, extensive riverfront parkland has been developed and is heavily used.

People viewing the aesthetic resources of the project area include highway travelers, recreational users of the river and surrounding lands, and local residents. The aesthetic values of the river and surrounding landscapes vary based on the viewers' perspectives and values. Highway travelers tend to view the resources as they are traveling on roadways through the area. These travelers tend to view the resources at a distance, generally from an automobile and generally at high rates of speed. Recreational users, such as boaters, campers, swimmers, and fishermen, tend to view the resources for longer periods of time due to the fact that they are involved in recreational activities that are dependent on the river setting. Local residents tend to view the resources as they go about their daily business in the vicinity of the river as well as when they use the river and surrounding lands for recreational purposes.

Viewing patterns vary seasonally in a manner similar to recreational uses of the river and surrounding lands, with more activities during the warm and sunny periods in late spring, summer, and early fall.

In-water disposal and habitat construction activities would have localized, short-term, adverse impacts on aesthetics. However, activities such as the creation of woody riparian habitat or shoreline restoration are expected to provide long-term aesthetic benefits.

2.6.3.5 Parks, National and Historical Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves.

Several HMUs, state parks, and recreational areas are located within the area covered by the DMMP. National Seashores, Wilderness Areas, and Wild and Scenic Rivers are not located within the area covered by the DMMP.

Some in-water disposal and habitat construction activities may have localized, short-term, adverse impacts on parks. However, the creation of woody riparian and shallow water habitat is expected to provide long-term benefits to the affected parks. Site-specific 404(b)(1) Evaluations will address specific park areas that may be impacted by proposed in-water disposal activities.

2.7 Determination of Cumulative Effects on the Aquatic Ecosystem

The in-water discharges of the dredged material are designed to create woody riparian habitat and/or shallow water fish habitat. The additional habitat is expected to provide long-term cumulative benefits for the aquatic ecosystem.

Localized benthic communities would periodically be displaced by dredging activities and buried by in-water discharge activities. However, these communities are expected to re-establish within six months to a year. The dredging and disposal would have the potential to negatively impact ESA-listed fish species, but these impacts would be minimized because few individuals of the listed species would be present during the in-water work window. Adverse effects on the aquatic ecosystem are expected to be localized and of limited duration. The short-term impacts of the in-water discharge and associated dredging will be mitigated by the long-term cumulative benefits of the additional habitat developed.

2.8 Determination of Secondary Effects on the Aquatic Ecosystem

Secondary effects, such as water level fluctuations, septic tank leaching, and surface runoff from residential or commercial development on fill, are not expected to be associated with the proposed in-water disposal and habitat construction activities.

3.0 FINDINGS OF COMPLIANCE OR NON-COMPLIANCE WITH THE RESTRICTIONS ON DISCHARGE

3.1 Adaptation of the Section 404(b)(1) Guidelines to this Evaluation

The 404(b)(1) Guidelines were used to evaluate potential effects of the proposed discharges and determine appropriate actions to minimize adverse affects. No significant adaptations of the Guidelines were made relative to this evaluation.

3.2 Evaluation of Availability of Practicable Alternatives to the Proposed Discharge Site which Would Have Less Adverse Impact on the Aquatic Ecosystem

The DMMP initially considered twelve sediment management practices. Four alternatives were developed from these practices and were further evaluated in the DMMP. The preferred alternative, which includes beneficial uses of dredged material in both upland and in-water settings, was determined to have the least adverse impact on the aquatic ecosystem.

3.3 Compliance with Applicable State Water Quality Standards

In-water disposal and habitat construction activities will be conducted and monitored for impacts to water quality. Actions will be taken to reduce resulting impacts to a level within the criteria set forth in applicable state standards.

3.4 Compliance with Applicable Toxic Effluent Standard or Prohibition Under Section 307 of the Clean Water Act

Materials to be dredged will be sampled prior to dredging. Materials found to have significant concentrations of toxic substances will not be used for in-water disposal.

3.5 Compliance with Endangered Species Act of 1973

BAs were prepared for anadromous fish species (Appendix F of the DMMP) and non-anadromous fish and terrestrial species (Appendix G of the DMMP). The Corps has initiated ESA consultations with the USFWS and NMFS regarding listed species in the area covered by the DMMP. The final findings of these agencies are included in Appendices F and G.

3.6 Compliance with Specified Protection Measures for Marine Sanctuaries Designated by the Marine Protection, Research, and Sanctuaries Act of 1972

Designated marine sanctuaries are not located within the area covered by the DMMP.

3.7 Evaluation of Extent of Degradation of the Waters of the United States

3.7.1 Significant Adverse Effects on Human Health and Welfare

3.7.1.1 Municipal and Private Water Supplies

Municipal and private water supplies are not expected to be adversely affected by the proposed in-water disposal activities.

3.7.1.2 Recreation and Commercial Fisheries

Commercial fisheries are not present within the area covered by the DMMP. Localized, short-term adverse impacts to recreational fisheries are expected to be mitigated by the long-term benefits provided by additional woody riparian and shallow water habitat.

3.7.1.3 Plankton

Significant adverse effects on plankton populations are not anticipated. For discharge sites where shallow water habitat creation is the selected beneficial use, localized, short-term adverse impacts to plankton are expected to be mitigated by the long-term benefits provided by the additional shallow water habitat.

3.7.1.4 Fish

Significant adverse effects on fish populations are not anticipated. For discharge sites where shallow water habitat creation is the selected beneficial use, potential localized, short-term adverse impacts to ESA-listed salmonids are expected to be mitigated by the long-term benefits provided by additional shallow water habitat.

3.7.1.5 Shellfish

Significant adverse effects on shellfish populations are not anticipated. For discharge sites where shallow water habitat creation is the selected beneficial use, localized, short-term adverse impacts to shellfish are expected to be mitigated by the long-term benefits provided by additional shallow water habitat.

3.7.1.6 Wildlife

Significant adverse effects on wildlife populations are not anticipated. For discharge sites where woody riparian or shallow water habitat creation is the selected beneficial use, potential localized, short-term adverse impacts to wildlife are expected to be mitigated by the long-term benefits provided by additional woody riparian or shallow water habitat.

3.7.1.7 Special Aquatic Sites

Potential discharge sites will be evaluated for the presence of special aquatic sites, including sanctuaries and refuges, wetlands, mud flats, vegetated shallows, coral reefs, and riffle and pool complexes. Such sites will be addressed in the site-specific 404(b)(1) Evaluation. In-water discharges will be designed to avoid impacts to special aquatic sites.

3.7.2 Significant Adverse Effects on Life Stages of Aquatic Life and Other Wildlife Dependent on Aquatic Ecosystems

The in-water work window had been scheduled to avoid migrations of ESA-listed anadromous fish. Significant adverse effects on life stages of aquatic life and other wildlife dependent on aquatic ecosystems are not anticipated. For discharge sites where woody riparian or shallow water habitat creation is the selected beneficial use, potential localized, short-term adverse effects are expected to be mitigated by the long-term benefits provided by additional woody riparian and shallow water habitat.

3.7.3 Significant Adverse Effects on Aquatic Ecosystem Diversity, Productivity and Stability

Significant adverse effects on aquatic ecosystem diversity, productivity, and stability are not anticipated. For discharge sites where woody riparian or shallow water habitat creation is the selected beneficial use, localized, short-term adverse effects on the productivity of plankton, nekton, and benthic communities within proposed disposal sites are expected to be mitigated by the creation of woody riparian and shallow water habitat. The additional shallow water habitat is expected to be conducive to recolonization by aquatic populations which are equally or more diverse, productive, and stable.

3.7.4 Significant Adverse Effects on Recreational, Aesthetic, and Economic Values

Adverse effects on economic values are not expected. Adverse effects on recreational and aesthetic values are expected to be localized and short-term. The long-term effects of creating additional woody riparian and shallow water habitat are expected to be beneficial to recreational, aesthetic, and economic values. Shoreline restoration and bank stabilization would provide long-term aesthetic benefits. Creation of additional port facilities would provide economic benefits.

3.8 Appropriate and Practicable Steps Taken to Minimize Potential Adverse Impacts of the Discharge on the Aquatic Ecosystem

- In-water disposal and habitat construction activities will be restricted to the in-water work window, which is currently December 15 through March 1 in the Snake and Clearwater Rivers, and December 1 through March 31 in the Columbia River.
- Materials to be dredged will be sampled and analyzed for grain size distribution and selected chemical concentrations prior to dredging.
- Dredged materials disposed of in-water will be selectively placed according to grain size distribution, in order to achieve the selected beneficial use.

- Dredged material disposed of in-water will not have significant contaminant concentrations.
- Water quality and sediment contaminant monitoring will be performed prior to, during, and after in-water disposal activities as described in the monitoring plan (Appendix M of the DMMP).

3.9 Finding of Compliance or Non-Compliance

Individual in-water disposal projects will be designed and conducted to comply with Section 404(b)(1) Guidelines. A Finding of Compliance or Non-Compliance will be completed in site-specific 404(b)(1) Evaluations. For each proposed dredging cycle, the site-specific 404(b)(1) and a request for Section 401 water quality certification will be submitted to the appropriate regulatory agency of the state(s) where the proposed discharge site is located.

The 404(b)(1) Evaluation for the proposed winter 2002-2003 work is included in Attachment 1 to Appendix N of the DMMP/EIS. A request for Section 401 water quality certification for the proposed winter 2002-2003 work will be submitted to the Washington Department of Ecology.